WBS Activity Guidelines & Recommendations

BTeV Document (number to be assigned)

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How To Access This Document

- Access the first BTeV internal web page
- Click on "BTeV WBS Level 2 Task Management Plans, Requirements, and Cost and Schedule"
- Click under WBS & WBS Dictionaries on "Instructions & Templates"

Revision History

- **March 3, 2001:** Removed 'DRAFT' from title page; removed hyphen from all references to trigger systems (*e.g.*, L-1 to L1)

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1 Introduction

This document is intended to aid the user in developing a task-oriented WBS for their BTeV project. The document gives guidelines and recommendations for BTeV's WBS Level 2 through Level 5 Tasks. It's sections contain the following information:

Section 1: Introduction

Section 2: Definition of terms

Section 3: WBS Activity guidelines for numbering and naming BTeV's Level 2 Tasks

Section 4: WBS Activity recommendations for BTeV's Level 3, Level 4 and Level 5 Tasks

This document should be used in conjunction with the document '*Guidelines For Developing A Task-Oriented WBS Structure*'.

2 Definition Of Terms

Various terms such as WBS, Activities, Level, Tasks, *etc.* will be continuously used throughout the remainder of this document. The following should help explain them:

WBS	Work Breakdown Structure: An organized list of jobs within an overall project such as BTeV. DOE requires a WBS and its accompanying WBS Dictionary
WBS Dictionary	A definition of each WBS item (job) giving enough information so a reader understands the job, who'll be doing the work, what is the scope of the work including required quantities, *etc.*
WBS Activity	One line (job, task, or item) in a WBS
WBS Number	A unique number given to each and every WBS Activity
Level	An indication of a WBS Activity's place in the WBS hierarchy
Level N WBS Activity	A WBS Activity with an N-digit WBS number
Level 2 Task	Name given by BTeV Management for a Level 2 (two-digit) WBS Activity
Level 2 Manager	Name given by BTeV Management to the person responsible for a Level 2 WBS Activity
Level 3 Task	Name given by BTeV Management for a Level 3 WBS Activity.
Level 3 Leader	Name given by BTeV Management to the person responsible for a Level 3 WBS Activity
Level N Task	Name given by BTeV Management for any WBS Activity below a Level 3 WBS Activity where the 'N' corresponds to the WBS Activity.
Level N Leader	Name given by BTeV Management to the person responsible for a Level N (Level 4 or lower-level) WBS Activity
Task-Oriented WBS	A WBS containing all cost and schedule information for each of its WBS Activities and one based on doing tasks (verb-based) *vs*. material goods (noun-based). DOE requires a task-oriented WBS.
task	A WBS Activity at a particular level of the WBS (Level 2 or lower)
subtask(s)	WBS Activity(s) that are under (at a lower level of) a task

3 Level 2 Tasks: WBS Activity Guidelines

The following are guidelines for numbering and naming BTeV's Level 2 Tasks (WBS Activities). The names are not fixed and may be changed if deemed appropriate. Electronics and software have been combined in both Level 2 Tasks 1.8 and 1.9.

1 BTeV Experiment
1.1 Vertex and Toroidal Magnets and Beam Pipe
1.2 Pixel Detector
1.3 RICH Detector
1.4 EM Calorimeter Detector
1.5 Muon Detector
1.6 Forward Tracker Straw Detector
1.7 Forward Tracker Silicon Microstrip Detector
1.8 Trigger Electronics and Software
1.9 Event Readout and Controls Electronics and Software
1.10 System Installation, Integration and Commissioning
1.11 BTeV Project Management

Cost and scheduling for the offline projects from the Proposal costing ('Analysis and Simulation Facilities' and 'Algorithm and Other Software and Integration') will be done separately to the above set of WBS Activities.

Each Level 2 Task group is responsible for generating their task's WBS. WBS Activity numbers and names for tasks given in this document are strictly suggestions and/or topics that should be included in your WBS. Most names come from the BTeV Proposal costing effort.

The technical, cost and schedule management of BTeV is made considerably more efficient by having symmetry and consistency, to the extent possible and practical, in the numbering and naming of similar WBS Activities. The recommendations given in this section attempt to accomplish this goal.

4 Level 3 & Lower-Level Tasks: WBS Activity Recommendations

The following subsections give WBS Activity recommendations for Level 3 and lower-level WBS Activities.

4.1 Vertex and Toroidal Magnets & Beam Pipe Level 3 Tasks

A possible list of Level 3 Tasks for the 'Vertex and Toroidal Magnets and Beam Pipe' Level 2 Task is given below.

1.1 Vertex and Toroidal Magnets and Beam Pipe
1.1.1 Vertex Magnet Acquisition
1.1.2 Vertex Magnet Modification and Assembly
1.1.3 Muon Toroids
1.1.4 Beam Pipes
1.1.5 Alarms and Limits Interface (to the Controls/Monitoring and Timing System)
1.1.6 Integration and Testing
1.1.7 ES&H
1.1.8 Transportation, Installation and Testing at C0
1.1.9 Vertex and Toroidal Magnets and Beam Pipe Task Management

4.2 Front-End Detector Systems Level 3 & Some Level 4 Tasks

A possible list of Level 3 and some Level 4 Tasks for front-end detector system Level 2 Tasks is given below.

1.2 Pixel Detector
1.2.1 Detectors and Sensors
1.2.2 Front-End Electronics and Interconnections to Sensors
1.2.2.1 Multi-Chip-Modules and Interconnections to Sensors
1.2.2.2 Packaging, Powering, Monitoring, Cooling and Protection
1.2.2.3 Pixel ICs
1.2.3 Mechanical, Gas and Calibration Systems
1.2.4 Other Support Systems (*e.g.,* alignment system, laser pulser system)
1.2.5 Test Beam Studies
1.2.6 Alarms and Limits Interface (to the Controls/Monitoring and Timing System)
1.2.7 Hardware and Software Specific To Pixel Development and Testing
1.2.8 Pixel Detector Integration and Testing
1.2.9 Transportation to and Installation and Testing at C0
1.2.10 ES&H
1.2.11 Pixel Detector Task Management

1.3 RICH Detector
1.3.1 Detectors and Sensors
1.3.2 Front-End Electronics and Interconnections to Sensors
1.3.2.1 Front-End Boards and Interconnections to Sensors
1.3.2.2 Packaging, Powering, Monitoring, Cooling and Protection
1.3.2.3 RICH ICs
1.3.3 Mechanical, Gas and Calibration Systems
1.3.4 Other Support Systems (*e.g.,* alignment system, laser pulser system)
1.3.5 Test Beam Studies
1.3.6 Alarms and Limits Interface (to the Controls/Monitoring and Timing System)
1.3.7 Hardware and Software Specific To RICH Development and Testing
1.3.8 RICH Detector Integration and Testing
1.3.9 ES&H
1.3.10 Transportation to and Installation and Testing at C0
1.3.11 RICH Detector Task Management

1.4 EM Calorimeter Detector
1.4.1 Detectors and Sensors
1.4.2 Front-End Electronics and Interconnections to Sensors
1.4.2.1 Front-End Boards and Interconnections to Sensors
1.4.2.2 Packaging, Powering, Monitoring, Cooling and Protection
1.4.2.3 QIE ICs
1.4.3 Mechanical, Gas and Calibration Systems
1.4.4 Other Support Systems (*e.g.,* alignment system, laser pulser system)
1.4.5 Test Beam Studies
1.4.6 Alarms and Limits Interface (to the Controls/Monitoring and Timing System)
1.4.7 Hardware and Software Specific To EM Calorimeter Development and Testing
1.4.8 EM Calorimeter Detector Integration and Testing
1.4.9 ES&H
1.4.10 Transportation to and Installation and Testing at C0
1.4.11 EM Calorimeter Detector Task Management

1.5 Muon Detector
1.5.1 Detectors and Sensors
1.5.2 Front-End Electronics and Interconnections to Sensors
1.5.2.1 Front-End Boards and Interconnections to Sensors
1.5.2.2 Packaging, Powering, Monitoring, Cooling and Protection
1.5.3 Mechanical, Gas and Calibration Systems
1.5.4 Other Support Systems (*e.g.,* alignment system, laser pulser system)
1.5.5 Test Beam Studies
1.5.6 Alarms and Limits Interface (to the Controls/Monitoring and Timing System)
1.5.7 Hardware and Software Specific To Muon Development and Testing
1.5.8 Muon Detector Integration and Testing
1.5.9 ES&H
1.5.10 Transportation to and Installation and Testing at C0

1.5.11 Muon Detector Task Management
1.6 Forward Tracker Straw Detector
1.6.1 Detectors and Sensors
1.6.2 Front-End Electronics and Interconnections to Sensors
1.6.2.1 Front-End Boards and Interconnections to Sensors
1.6.2.2 Packaging, Powering, Monitoring, Cooling and Protection
1.6.2.3 TDC ICs
1.6.3 Mechanical, Gas and Calibration Systems
1.6.4 Other Support Systems (*e.g.,* alignment system, laser pulser system)
1.6.5 Test Beam Studies
1.6.6 Alarms and Limits Interface (to the Controls/Monitoring and Timing System)
1.6.7 Hardware and Software Specific To Straw Development and Testing
1.6.8 Forward Tracker Straw Detector Integration and Testing
1.6.9 ES&H
1.6.10 Transportation to and Installation and Testing at C0
1.6.11 Forward Tracker Straw Detector Task Management
1.7 Forward Tracker Silicon Microstrip Detector
1.7.1 Detectors and Sensors
1.7.2 Front-End Electronics and Interconnections to Sensors
1.7.2.1 Multi-Chip-Modules and Interconnections to Sensors
1.7.2.2 Packaging, Powering, Monitoring, Cooling and Protection
1.7.2.3 Silicon ICs
1.7.3 Mechanical, Gas and Calibration Systems
1.7.4 Other Support Systems (*e.g.,* alignment system, laser pulser system)
1.7.5 Test Beam Studies
1.7.6 Alarms and Limits Interface (to the Controls/Monitoring and Timing System)
1.7.7 Hardware and Software Specific To Silicon Microstrip Development and Testing
1.7.8 Forward Tracker Silicon Microstrip Detector Integration and Testing
1.7.9 ES&H
1.7.10 Transportation to and Installation and Testing at C0
1.7.11 Forward Tracker Silicon Microstrip Detector Task Management

4.3 Trigger Level 3 & Level 4 & Some Level 5 Tasks

The following subsections give WBS Activity recommendations for Level 3 and Level 4 and some Level 5 Tasks for the 'Trigger Electronics and Software' Level 2 Task.

4.3.1 Trigger Level 3 and Level 4 Tasks

A possible list of Level 3 and Level 4 Tasks for the 'Trigger Electronics and Software' Level 2 Task is given below.

1.8 Trigger Electronics and Software
1.8.1 L1 Trigger Electronics and Software
1.8.1.1 Pixel Trigger
1.8.1.2 Muon Trigger
1.8.1.3 Calibration and Random Triggers
1.8.1.4 Global L1 Trigger
1.8.1.5 L1 Trigger Supervisor and Monitor
1.8.2 L2 and L3 Trigger Algorithms, Electronics and Software
1.8.2.1 L2 Trigger Algorithms
1.8.2.2 L3 Trigger Algorithms
1.8.2.3 L2 and L3 Electronics & Software
1.8.3 Trigger Task Management

4.3.2 Trigger Level 5 Tasks

A possible list of Level 5 Tasks for the 'Trigger Electronics and Software' Level 2 Task is given below.

1.8 Trigger Electronics and Software
1.8.1 L1 Trigger Electronics and Software
1.8.1.1 Pixel Trigger
1.8.1.1.1 Electronics
1.8.1.1.2 Packaging, Powering, Monitoring, Cooling and Protection
1.8.1.1.3 Alarms and Limits Interface (to the Controls/Monitoring and Timing System)
1.8.1.1.4 Hardware and Software Specific To Pixel Trigger Development and Testing
1.8.1.1.5 Software
1.8.1.1.6 Pixel Trigger Integration and Testing
1.8.1.1.7 ES&H
1.8.1.1.8 Transportation to and Installation and Testing at C0
1.8.1.1.9 Pixel Trigger Task Management
1.8.1.2 Muon Trigger
1.8.1.2.1 Electronics
1.8.1.2.2 Packaging, Powering, Monitoring, Cooling and Protection
1.8.1.2.3 Alarms and Limits Interface (to the Controls/Monitoring and Timing System)
1.8.1.2.4 Hardware and Software Specific To Muon Trigger Development and Testing
1.8.1.2.5 Software
1.8.1.2.6 Muon Trigger Integration and Testing
1.8.1.2.7 ES&H
1.8.1.2.8 Transportation to and Installation and Testing at C0
1.8.1.2.9 Muon Trigger Task Management
1.8.1.3 Calibration and Random Triggers
1.8.1.3.1 Electronics
1.8.1.3.2 Packaging, Powering, Monitoring, Cooling and Protection
1.8.1.3.3 Alarms and Limits Interface (to the Controls/Monitoring and Timing System)
1.8.1.3.4 Hardware and Software Specific To Calibration and Random Triggers Development and Testing
1.8.1.3.5 Software
1.8.1.3.6 Calibration and Random Triggers Integration and Testing
1.8.1.3.7 ES&H
1.8.1.3.8 Transportation to and Installation and Testing at C0
1.8.1.3.9 Calibration and Random Triggers Task Management
1.8.1.4 Global L1 Trigger
1.8.1.4.1 Electronics
1.8.1.4.2 Packaging, Powering, Monitoring, Cooling and Protection
1.8.1.4.3 Alarms and Limits Interface (to the Controls/Monitoring and Timing System)
1.8.1.4.4 Hardware and Software Specific To Global L1 Trigger Development and Testing
1.8.1.4.5 Software
1.8.1.4.6 Global L1 Trigger Integration and Testing
1.8.1.4.7 ES&H
1.8.1.4.8 Transportation to and Installation and Testing at C0
1.8.1.4.9 Global L1 Trigger Task Management
1.8.1.5 L1 Trigger Supervisor and Monitor
1.8.1.5.1 Electronics
1.8.1.5.2 Packaging, Powering, Monitoring, Cooling and Protection
1.8.1.5.3 Alarms and Limits Interface (to the Controls/Monitoring and Timing System)
1.8.1.5.4 Hardware and Software Specific to L1 Trigger Supervisor and Monitor Development and Testing
1.8.1.5.5 Software
1.8.1.5.6 L1 Trigger Supervisor and Monitor Integration and Testing
1.8.1.5.7 ES&H
1.8.1.5.8 Transportation to and Installation and Testing at C0
1.8.1.5.9 L1 Trigger Supervisor and Monitor Task Management
1.8.2 L2 and L3 Trigger Algorithms, Electronics and Software

1.8.2.1 L2 Trigger Algorithms
1.8.2.1.1 L2 Algorithm Software
1.8.2.1.2 Testing at C0
1.8.2.1.3 L2 Trigger Algorithms Task Management
1.8.2.2 L3 Trigger Algorithms
1.8.2.2.1 L3 Algorithm Software
1.8.2.2.2 Testing at C0
1.8.2.2.3 L3 Trigger Algorithms Task Management
1.8.2.3 L2 and L3 Trigger Electronics and Software
1.8.2.3.1 Processors
1.8.2.3.2 Infrastructure
1.8.2.3.3 Disk System
1.8.2.3.4 Network Connections
1.8.2.3.5 Tape Drives
1.8.2.3.6 Connections To The Feynmann Computing Center
1.8.2.3.7 Alarms and Limits Interface (to the Controls/Monitoring and Timing System
1.8.2.3.8 Hardware and Software Specific To L2 and L3 Trigger Development and Testing
1.8.2.3.9 Event Data Histogramming and Other Software
1.8.2.3.10 L2 and L3 Trigger Integration and Testing
1.8.2.3.11 ES&H
1.8.2.3.12 Transportation to and Installation and Testing at C0
1.8.2.3.13 L2 and L3 Trigger Task Management
1.8.3 Trigger Task Management

4.4 Data Acquisition, Controls/Monitoring, Timing, Control Room & Test Electronics & Software Level 3 & Level 4 Tasks

The 'Event Readout and Controls Electronics and Software' Level 2 Task includes for data acquisition, controls, monitoring, (fast) timing, control room and test electronics and software. A possible list of Level 3 and Level 4 Tasks for the 'Event Readout and Controls Electronics and Software' Level 2 Task is given below.

1.9 Event Readout and Controls Electronics and Software
1.9.1 Data Acquisition
1.9.1.1 Electronics and Links
1.9.1.2 Embedded Software
1.9.1.3 Alarms and Limits Interface (to the Controls/Monitoring and Timing System)
1.9.1.4 Hardware and Software Specific To Data Acquisition Development and Testing
1.9.1.5 Data Acquisition Integration and Testing
1.9.1.6 ES&H
1.9.1.7 Transportation to and Installation and Testing at C0
1.9.1.8 Data Acquisition Task Management
1.9.2 Controls/Monitoring and Timing
1.9.2.1 Controls/Monitoring Electronics and Links
1.9.2.2 Control Room Electronics and Infrastructure
1.9.2.3 Fast Timing Electronics and Links
1.9.2.4 Slow Controls and Monitoring Software
1.9.2.5 Run Control Software
1.9.2.6 Data Logging Software
1.9.2.7 Database Software
1.9.2.8 Interface to the Accelerator Clock System
1.9.2.9 Hardware and Software Specific To Controls/Monitoring and Timing Development and Testing
1.9.2.10 Controls/Monitoring and Timing Integration and Testing
1.9.2.11 ES&H
1.9.2.12 Transportation to and Installation and Testing at C0
1.9.2.13 Controls/Monitoring and Timing Task Management
1.9.3 Test Stand, Test Beam and Test Equipment Electronics and Software
1.9.3.1 Test Stand Electronics

1.9.3.2 Test Equipment Electronics
1.9.3.3 Test Stand and Test Beam Software
1.9.3.4 Test Stand, Test Beam and Test Equipment Task Management
1.9.4 Event Readout and Controls Task Management

4.5 System Installation, Integration and Commissioning Level 3 Tasks

A possible list of Level 3 Tasks for the 'System Installation, Integration and Commissioning' Level 2 Task is given below.

1.10 System Installation, Integration and Commissioning
1.10.1 Installation
1.10.2 Procedure Specifications
1.10.3 Commission Control, Timing, and Monitoring System
1.10.4 Establish Simplest Data Readout Path
1.10.5 Integrate Accelerator Clock with BTeV C/M&T System
1.10.6 Establish Front-End Timing
1.10.7 System Integration Without Triggers and Event Builder
1.10.8 L1 Trigger Testing
1.10.9 L2 and L3 Trigger Testing
1.10.10 Trigger Integration and Testing
1.10.11 Partial Data Acquisition System Testing
1.10.12 Data Acquisition and Controls/Monitoring and Timing Integration and Testing
1.10.13 Integration and Testing of Front-End Systems with Their Triggers
1.10.14 System Integration Testing and Commissioning
1.10.15 Establish and Test Data Acquisition Procedures
1.10.16 Establish Detector Alignment Procedures
1.10.17 Establish Detector Calibration Procedures
1.10.18 ES&H
1.10.19 System Installation, Integration and Commissioning Task Management

4.6 BTeV Project Management Level 3 Tasks

A possible list of Level 3 Tasks for the 'BTeV Project Management' Level 2 Task is given below.

1.11 BTeV Project Management
1.11.1 BTeV Project Office
1.11.2 Support for Project Management Activities of BTeV Physicists
1.11.3 Support for External Reviews and Consultants
1.11.4 Support for Documentation, Report Preparation and Distribution
1.11.5 Project Management Software Tools
1.11.6 Project Documentation Software Tools
1.11.7 Oversight of BTeV ES&H